Year 6

Conceptual narrative Science: The Earth's surface

In the Earth and space sciences sub-strand, there are two main conceptual threads being developed from Foundation through to Year 10, Earth in space and the Earth's surface.

Big ideas

Changes in the surface of the Earth can operate over time frames from sudden to slow.

What concepts do I want my students to understand?

- Earthquakes and volcanoes cause sudden changes and may trigger other events.
- Science can help predict and explain these events and their effects.

Appendix 1 shows how the three interwoven strands, Science Understanding, Science as a Human Endeavour and Science Inquiry Skills, work together to build the sophistication and complexity of the science concepts from Foundation to Year 10.

This conceptual narrative illustrates one of the nine science concepts from the Australian Curriculum: Science Content structure. It tells the story of the concept in isolation of the eight others. However, there are situations when it is advisable to teach both concepts, (Earth in space and the Earth's surface) together, because they complement each other.

Note: Not all concepts are specifically addressed in each year level.

Introduction

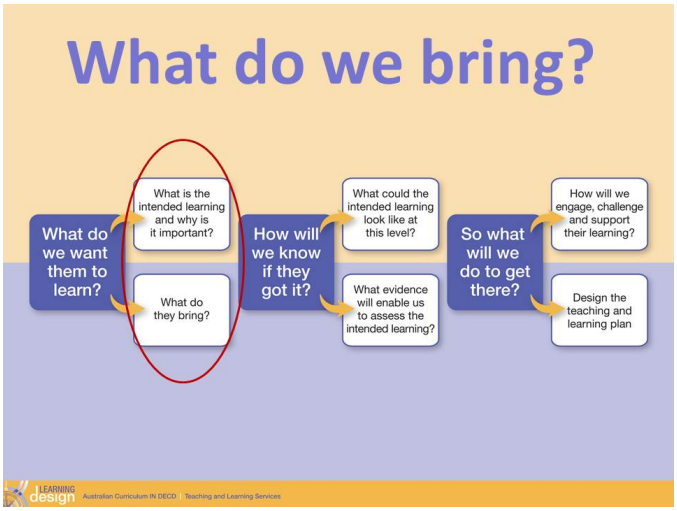
What might my students already know about this concept?

Students will be aware that weather can cause gradual change in the features of the surface of the Earth and that earthquakes and volcanic eruptions are catastrophic events with far reaching effects.

What content could I use to explore this concept?

There are a number of examples teachers could use to investigate sudden geological events. They could look at recent disasters, the history of disasters in the local area, or the role of science in the prediction and response to these events.

Now to bring the essence of scientific understanding to life, let's think about this concept through the six questions from the Bringing it to Life tool (BitL).



The science understanding for Year 6 is that changes in the surface of the Earth include changes associated with sudden geological events.

Year 6 example

For this example, students will explore earthquakes and volcanic events in the Australian area using government internet data - maps and data about recent events.

What do you notice?

How can I help my students make observations?

Using the BitL questions, I could ask:

- *What do you notice?*

In Year 6, we want to extend students observations to working with secondary data sources. We could provide access to data on recent earthquake activity in Australia and nearby places and tectonic maps of the Earth and ask:

- *What do you notice about where the earthquakes and volcanoes are and how often they occur?*
- *How is the damage or the strength of them measured?*
- *What is interesting?*

What patterns and relationships can you see?

How can I help students to see patterns and relationships? What questions might my students ask?

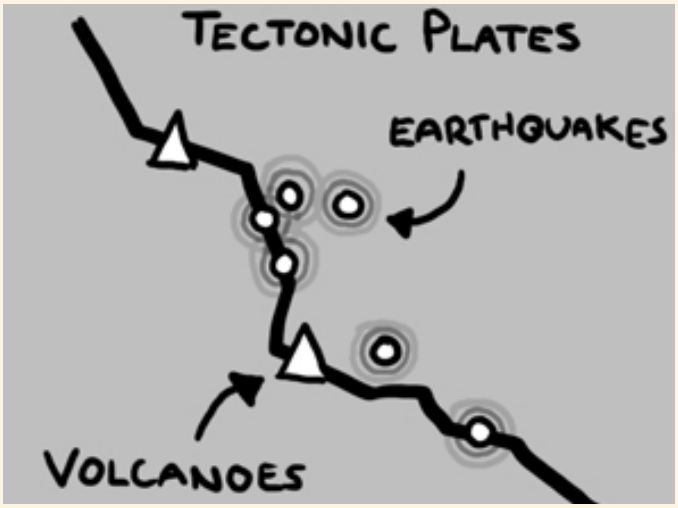
Student's curiosity leads them to ask questions. These questions help students to order their findings into a pattern to be able to make comparisons or find relationships. These questions support students to be more precise and foster analysis and classification of the observations.

Using the BitL questions, I could ask:

- *What patterns and relationships can you see?*

We want our students to notice the patterns and relationships between variables. To help students notice the patterns, I could prompt the students by asking:

- *What do the events (earthquakes and volcanic eruptions) have in common? Are there any exceptions?*
- *Is there anything unusual?*
- *What is happening over time?*
- *Are there any changes?*
- *What is the relationship between earthquakes and volcanoes?*



What do you predict?

How can I help students to identify and formulate investigable questions?

Students ask testable questions that help them to narrow the focus of the inquiry. These questions provide opportunities for students to make predictions.

Using the BitL questions, I could ask:

- *What do you predict?*

In Year 6, we want our students to test their predictions by gathering data and using the evidence to develop their explanation. I could ask:

- *When and where do you think the next earthquake is most likely to be? Least likely to be?*
- *Where else in the world would you predict high earthquake activity? Low earthquake activity?*

How can you test it?

These questions support students to develop science inquiry skills and problem solve.

Using the BitL questions, I could ask:

- *How can you test it?*

In Year 6, we want students to use digital technologies in their investigations. I could ask students to make suggestions on how they could investigate their questions. For example:

- *How can you test your idea?*
- *What data could you use?*
- *Where does the data come from? Whose information is it?*
- *Who might see it differently?*
- *Is there a situation where safety or equipment limits the primary source information?*
- *Is secondary data sufficient?*
- *Is secondary data valid and reliable?*
- *What might a scientist do to find out about that?*

How can you review and communicate?

How can I help students share their observations and questions?

These questions stimulate student's reasoning and help them analyse, draw conclusions and make generalisations about the concepts.

Using the BitL questions, I could ask:

- *How can you review and communicate?*

In Year 6, we want our students to record and communicate their data and thinking. I might ask the students:

- *How can you share the information you have found with others?*
- *What tools (lists, table. graph, map and drawing) might you use to identify patterns and share this information?*
- *Would a model or digital technology help explain your ideas?*
- *Did other people find something different to you?*
- *Was what you found the same or different to what you predicted? How?*
- *How could you improve your investigation?*

So what? What next?

How can I help students apply the concepts in a range of authentic contexts?

These questions support student's reasoning, to expand or change their ideas from their experience and evidence and generalise to new contexts.

Using the BitL questions, I could ask:

- *So What? What next?*

We want students to see how scientific knowledge and understanding are used to solve problems that inform personal and community decisions. We want students to see that people from a range of cultures have made important contributions to the advancement of science. As the teacher we could ask:

- *Why is it important to know when and where volcanoes and earthquakes are likely to happen?*
- *How does understanding this help us to protect ourselves and our environment?*
- *Who might be interested in this information?*
- *How might this change the way the way you choose to behave/act in the future?*
- *What else could you investigate?*

Concluding comments

What concepts might students develop through working with the BitL questions in this way?

By exploring this science understanding through these questions, we can help our students to be able to think, work and process scientifically. Students can connect science to their world and consider why they need to learn about the causes of sudden geographical events.

Appendix 1

Appendix 1 shows how the three interwoven strands, Science Understanding, Science as a Human Endeavour and Science Inquiry Skills, work together to build the sophistication and complexity of the science concepts from Foundation to Year 10.

This conceptual narrative illustrates one of the nine science concepts from the Australian Curriculum: Science Content structure. These concepts develop in depth and breadth of understanding from Foundation to Year 10. This conceptual narrative tells the story of the concept in isolation of the eight others. However, there are situations when it is advisable to teach both concepts (Earth in space and the Earth's surface) together, because they complement each other.

Note: Not all concepts are specifically addressed in each year level.

Earth and space sciences

In the Earth and space sciences sub-strand, there are two main conceptual threads being developed from Foundation through to Year 10. They are the concepts Earth in space and the Earth's surface. Let's look at the concept the Earth's surface.

Foundation

This begins in the Foundation year with students linking the weather to the effects it has on their daily life, for example how the weather can determine what clothing they wear.

Year 1

In Year 1, students observe changes in the landscape, such as water evaporating from a puddle or a sand castle washing away after the tide comes in.

Year 2

In Year 2, students focus on how we use resources from the Earth, including water. We want students to understand how they use water so they can identify ways to conserve water.

Year 4

At Year 4, students look at a range of changes to the surface of the Earth over time. Students group these changes as those caused by natural agents such as erosion or by human activity such as deforestation.

Year 6

In Year 6, students learn that sudden geological changes like earthquakes and volcanoes, and extreme weather conditions like hurricanes can affect the Earth's surface.

Year 7

In Year 7, students group the Earth's resources as renewable or non-renewable. For example, students can compare fossil fuels which take millions of years to form with wood that grows in decades and biofuel that grows in months. They also learn about the water cycle and that water is as an important resource.

Year 8

In Year 8, students develop an understanding of the rock cycle. They consider the timescale of the processes and formation of igneous, sedimentary and metamorphic rocks. Students also learn that rocks are made up of minerals.

Year 9

When students are in Year 9, they use the theory of plate tectonics to explain how major continental plate movement predicts areas prone to earthquakes and volcanic activity. Students identify global patterns of geological activity, such as considering the role of heat energy and convection currents in the movement of tectonic plates, and relating the extreme age and stability of a large part of the Australian continent to its plate tectonic history.

Year 10

In Year 10, students understand the connections between the different systems that make up the surface of the Earth. They appreciate how cycles of carbon and other materials involve interactions in the hydrosphere, lithosphere, atmosphere and biosphere. Students learn the role of carbon in the greenhouse effect and its effects on biodiversity.

So from Foundation to Year 10, students broaden and deepen their understanding by building on from their thinking about changes in their immediate surroundings, to consider those in the wider world, and then use models and theories to describe, explain, predict and generalise.